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"WRITTEN SO YOU CAN UNDERSTAND IT."

POPULAR MECHANICS

An Illustrated Weekly Review of the Mechanical Press of the World

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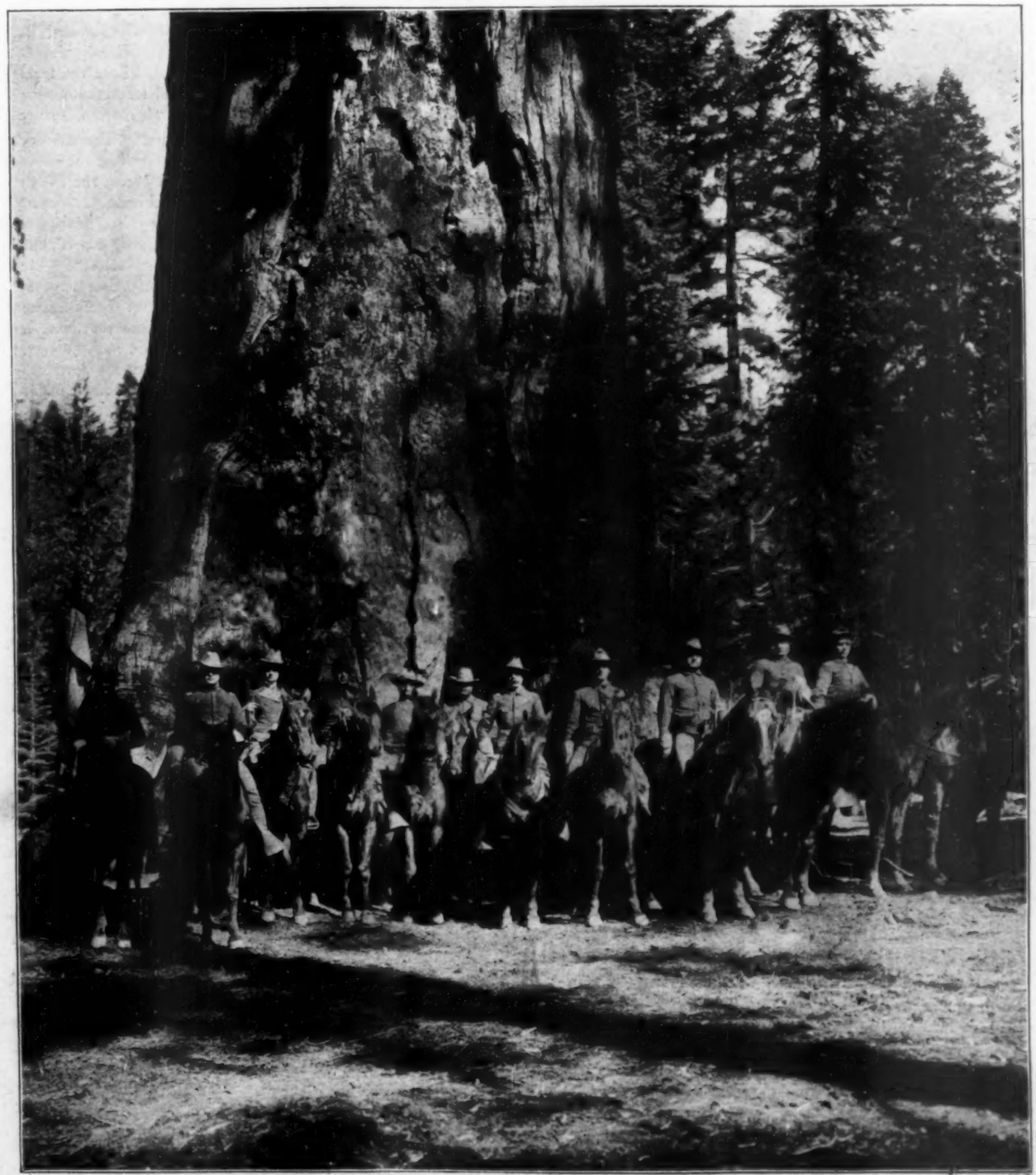
MOST REMARKABLE TREE OF THE WORLD

The Grizzly Giant Saw the Flood and is Older Than Human Nature



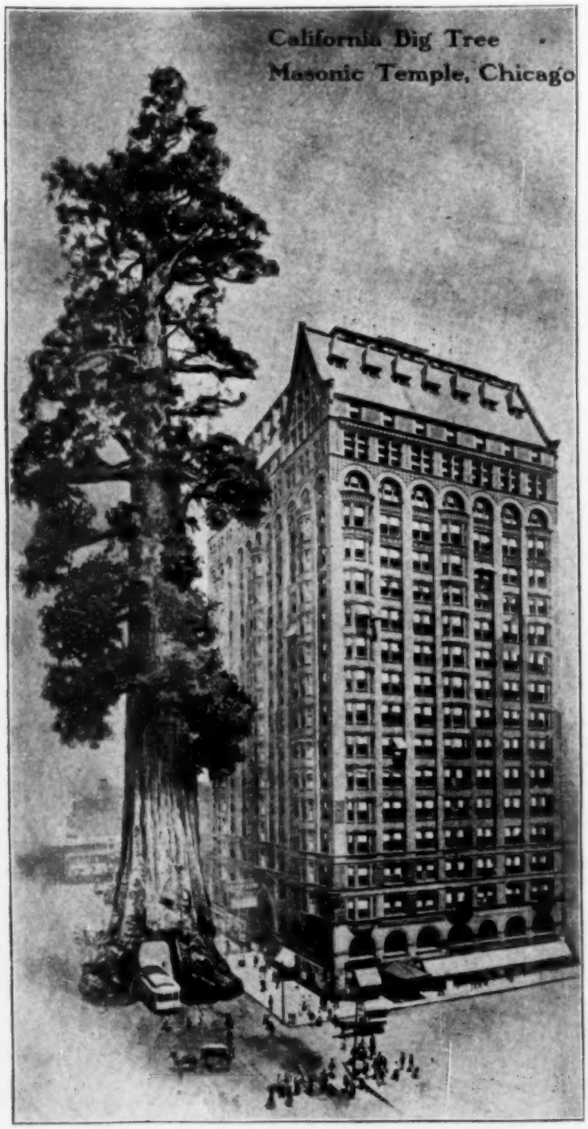
THE GRIZZLY GIANT Copyrighted by the Southern Pacific Railroad.

OF CONGRESS
FEB 27 1902
SMITHSONIAN DEPOSIT

GIANT TREES HAVE STOOD FOR 8,000 YEARS.

Monarchs of the World's Flora That Have Outlived All Ages of Mankind and Are Yet Young.

Survivors of the age of mammoth tropical growth, probably eight thousand years ago, the big trees of California are the oldest and the largest living things upon the earth. Could they but talk our language the secrets and mysteries of ages unknown to human history might be truthfully revealed. They witnessed the flood; they stood when, according to history, mankind first made his appearance on the earth. These same living trees, seemingly unnatural in their gigantic size, the source of amazement and bewilderment to travelers, have outlived all the nations of the earth up to the present time and many of them now seem to be but enjoying the prime of life.



COMPARATIVE SIZE OF THE WORLD'S LARGEST TREE, 405 FEET HIGH, AND THE LARGEST BUILDING, 305 FEET HIGH.

The tallest of these great trees is 405 feet high; the largest trunk measures 110 feet base circumference. The wood of the big trees might be put to many valuable usages from a mechanical standpoint, but they are considered too sacred for such degradation. Already they have been mutilated to a degree that is a stigma on American sense of reverence. Great gates have been cut in them for horses and vehicles to drive through. Houses have been built on their stumps. They have been hollowed out for liquor inns, in this irreverent day of commercialism. One was exhibited at the world's fair in Chicago by a wine dealer. Part of the tree's trunk was made hollow by chopping away the interior and thus transformed into a two-story wine house. The exterior of the trunk remained in its natural state, while the interior was equipped with counters, shelves, mirrors and other furniture to best exhibit the wines of California. Ornamented stairs inside led from the first to the second floor.

It has been said: "A famous writer scientist spent 15 years excavation and calculation and determined that Cheops built the great pyramids of Jeezeh in 2170 before Christ. There are trees now alive in California that had bark on them a foot thick when Cheop's army of 100,000 began their 30 year's task."

Sequoia gigantea is the botanical name of the Californian. It belongs to the tribe Abietineae and substribe Taxodinae. It grows where the ground is from 3,500 to 7,500 above the level of the sea. The big tree is found in groves and forests along the western slope of the Sierra Nevada mountains from Placer county on the north to Kern county on the south. The country is reached by the Southern Pacific Railroad. Among the more noted groves are Calveras, with about 100 huge trees; the South Park Grove, containing 1,380 trees; the Tuolumne Grove of thirty; the Merced Grove, with not quite so many; the Mariposa Grove, with 246 giants; the Fresno Grove; the Dinky Grove; the General Grant National Park; the Giant Forest, and the Tule River Groves. There are a number of others of lesser importance. Largest of all these and the greatest forest of the globe is the Giant Forest. In here there are 3,000 trees that have a height of more than 300 feet and a girth of more than 50 feet. The tallest is 405 feet. The General Sherman, says a statistics gatherer for the Southern Pacific Railroad, has by government measurements, a base circumference of more than 100 feet; diameter 34½ feet and is 370 feet high. Eighty feet above the ground its circumference is 80 feet.

The Grizzly Giant, which we illustrate on the front page, is in many respects the most remarkable tree in the world. The picture shows the tree surrounded by a troop of United States cavalry. The Giant is in the Mariposa Grove. Its base circumference is 104 feet. Five feet above the ground it is 90 feet. A limb 80 feet above the ground is 20 feet in circumference. In Mariposa Grove driveways are cut through two of the living trees —the Wawona and California. In the Haverford there is a cavity which will shelter 16 horses at a time. The General Grant in the General Grant National Park has a base circumference of 106 feet. The dead Giant, spanning Crescent Meadow, is 310 feet long. Old Methuselah, in the Tule River Groves, has a base circumference of more than 110 feet. General Manager Ampere Ohm of the Great Circle Telegraph company, said:

"General Sherman, of the Giant Forest, contains 750,000 feet of lumber. This if cut into telegraph poles of usual dimensions would make one pole 40 miles long. or supply a telegraph line from Kansas City to Chicago with all necessary supports. A billboard man said one big tree would furnish 24 miles of billboard 6 feet high. A city surveyor said that if an incorporated town, a mile square, was laid out with blocks 400 feet long and 80 feet wide, were provided with the lumber that might be obtained from one of these trees, he could put in a 4-foot sidewalk around every block without calling for more lumber. According to government estimates of weights, General Grant in the Mariposa Grove, or General Sherman in the Giant Forest would outweigh the entire population of Sacramento, Cal. Three of the largest trees would balance the weight of Omaha or Los Angeles." An Irishman said: "There's wan limb on the Grizzly Joint that's siven fut thick. There's a dozen others from three to six fut; thin there's a whole raft of thim small limbs that's no thicker than an ordnery tree. The last two weeks Oi was in this grove Oi put in an hour ivery day countin' thim limbs an' an hour ivery night makin' figgers, an' found that if you cut the limbs off this tree and stuck thim in the ground wid room ac-

cordin' to their size, they would make a bigger forest, with bigger trees in it, than there is annywhere in the State of Illinoy."

The Big Tree is an evergreen. Its leaves are small like those of the fir. It does not spread like the oak, its trunk being as straight as a church spire. The bark is sometimes more than three feet thick. The color of the bark is of bright cinnamon. The tree grows from seed that look almost exactly like parsnip seed. These seeds grow on the tree in little cones about two inches long and each having about 200 seeds. The cones hang on the trees three years before they drop and scatter the seeds. It takes from thirty to fifty years for the Big Tree to add one inch to its thickness.

HORSE MEAT SHIPPED FROM CHICAGO.

Food Commissioner Declares Four Establishments Are Engaged in the Business.

Four establishments in Chicago are engaged in slaughtering horses and selling the carcasses in the market for beef, according to the assertions of R. M. Patterson, assistant state food commisioner of Illinois. Officials of the large packing houses of Chicago, it is claimed, will demand that Mr. Patterson produce proof of his claim. Secretary Prichard of the Health department, declares there is but one horse-killing concern in Chicago. "This concern," he says, "at present sends the horse-meat to a circus at Baraboo, Wis., to be fed to animals. The portions of the meat that are not suitable for shipment are hauled to the rendering plant at Willow Springs."

FEAR EXTINCTION OF GUTTA PERCHA TREES.

Wasteful Methods of Islanders in Marketing the Gum.

Grave fear of the extinction of the gutta-percha tree is expressed by scientists and others, because of the wasteful process of marketing. In the forests of the Malay Peninsula and in Malacca the natives uproot full grown trees and cut young plants before they come to maturity. The trade Journals' Review says:

In 1845 Europe imported only 19,841 lbs. of gutta-percha; in 1857, when the Singapore supply was exhausted, the Malay Archipelago exported more than 529,104 lbs.; in 1879 Sumatran exportations exceeded 299,621 lbs., and Borneo exported 2,863,900 lbs. In order to attain these figures it is estimated that the natives must have sacrificed more than 5,000,000 trees. Scientists in France are now engaged upon the problem of acclimatising the tree in that country.

Large quantities of guta-percha trees have been found in the Philippines.

IN OPPOSITION TO MARCONI.

French Society Formed For Exploiting Wireless Telegraphy.

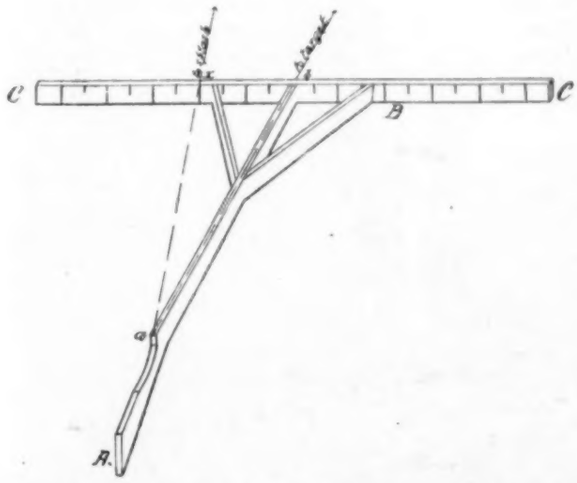
"The Society of Wireless Telegraphy and Telephones" has opened handsome offices in Paris and called for public subscription, which, it is claimed, has already reached twice the sum wanted. The promoters say it will be impossible for Marconi to patent his system in France, as the discovery was originally French. The society has submitted to the government two propositions; one for a trans-Saharan system connecting the Mediterranean, Lake Chad and Madagascar; the other for a network covering the entire French coast for military and political purposes.

Marconi has recovered from his illness and will resume his experiments in wireless telegraphy as soon as his two trans-Atlantic stations (one of which will be located at Cape Cod) are completed.

FOR DETERMINING ACCURACY OF AIM.

Novel Device Used By United States Artillery School at Ft. Monroe.

In the coast artillery target practice at Fort Monroe, Va., a new and novel device has been installed for recording the degree of accuracy of aim when the shot falls shorts of or beyond the the target. The targets are in the water and are made movable by being towed by a tug with a line 2,000 feet long. The shots are fired from the shore battery. In describing the system the Journal of the United States Artillery says:



"The observer on the tug at the instant the discharge of the gun was noted by signal from the shore, held the gun form against his shoulder, with his eye at the point a, and directed the line of sight a-b on the low target. At the instant the splash appeared he glanced the eye quickly to it, and noted the reading on the cross-arm scale, say at x in the figure. It was sufficient to divide the scale into 30-yard divisions for the smallest reading. Splashes falling between these divisions could be estimated with sufficient accuracy."

NEW SCISSORS THAT SHARPENS THEMSELVES.

A novelty in the shears and scissors line has been perfected by a Chicago concern. The invention consists of a spring connecting the blades of the scissors, which prevents them from loosening or falling apart while in use. The spring keeps the

tension of the blades steady and continuous, and its action has the further effect of producing an edge that always remains as sharp as a razor. The scissors can be used with either hand and they will cut the strongest or the flimsiest material as the cloth cannot slip from the grasp of the keen blades.

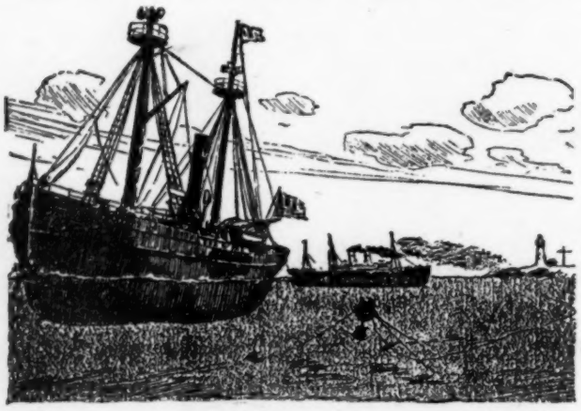
The latest marvel in surgery is the filling out of defective organs by the injection of a vaseline-paraffine compound under the skin. In this way noses that have been broken in; chins from which a portion of the jaw-bone has been removed, and similar features may be filled out. The bodily tissues invade the injected compound, and a hard body similar to cartilage is formed.

DESTROYS POWER OF TORPEDO BOAT.

Signal System by Which the Approach of Any Vessel May Be Easily Detected.

The recollection of the child's experiment of striking two stones under water and hearing the sound while the ears were submerged has caused Arthur J. Mundy of Boston to make one of the greatest inventions of the age. It is the system of submarine signalling soon to go into practical operation at the entrance of the Boston harbor. The receiving apparatus enables a warship to determine the approach of an enemy, say a submarine torpedo boat, by detecting the vibration of its machinery

The system is based upon the principle that water, being a stable medium, transmits sound under conditions that practically table medium, transmits sound under conditions that practically are unvarying; that it is certain that a signal given under water



will always be heard at the place and time intended. The same principles will be applied for communicating with light ships anchored at marine stations, and can also be employed for signaling to passing ships to indicate location in fog. Two submerged bells will be placed on either side of the harbor entrance. The bells are struck simultaneously through electric cable connections from the shore. They sound different numbers and therefore can easily be identified the same as fog horn signals and flash lights.

ONLY PIGEON RANCH IN THE WORLD.

Buildings and Grounds Covered With the Gigantic Flock—40,000 Squabs Marketed Annually.

Covering about eight acres of sandy, gravelly ground in the bed of the Los Angeles river, near Los Angeles, Cal., is an enormous ark-shaped loft, or pigeon house. It is the only organized pigeon ranch in the world. Fifteen thousand birds fairly cover the ground and loft, so that, at times, from a distance it appears as though some of the snow from the neighboring Sierras had been dropped upon the roof. The increase of this gigantic flock is enormous. If the market should fail, the owner would be utterly unable to feed his birds, as in less than two years he would have more than a million of them on his hands. Fortunately the demand is better than the supply and the pigeon ranch sends about 40,000 squabs a year to the market. The gross income is about $9,000 a year. The average price per dozen for the birds is about $3, sometimes ranging up to $10. The birds are fed three times a day, each meal costing approximately $5 for all, so the annual food bill is about $5,500. The food consists mainly of wheat screenings, boiled meal and stale bread. The daily consumption is about twelve sacks of screenings, eight sacks of wheat and many gallons of boiled meal. The bread is an additional fattener given during the week.

CARNEGIE WRITES HIS OWN EPITAPH.

Knew How to Assemble the Talents of Others—Noted Epitaphs of History.

Andrew Carnegie has suggested an inscription which he wishes to adorn his own tombstone. He is not the only one who has wished to write his own epitaph. Bismarck said: "I have only one ambition left; I should like a good epitaph." His wish has been granted, though he did not write his own. The one on the monument to Copernicus is "He commanded the sun to stand still." One of the best ever written is Lord Tennyson's epitaph on Sir John Franklin in Westminster abbey:

"Not here, the white North has thy bones; and thou, Heroic sailor soul,
"Art passing on thy happier voyage now
"Toward the earthly pole."

Benjamin Franklin wrote for himself an epitaph wherein he compared his body to the cover of a destroyed book, which "will not be lost for it will appear once more in a new and more beautiful edition, corrected and amended by the author." George Washington's epitaph is felicitous but one brief sentence of Gladstone's includes it all: "The purest figure in history."

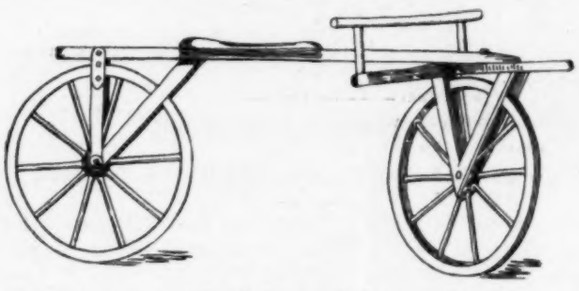
This is Mr. Carnegie's proposed epitaph:

"Here lies a man who knew how to get around him men much greater than himself."

The New York World says: Mr. Carnegie's ability to assemble and direct the talents and energies of other men has been no doubt the prime factor in the making of his great fortune. But a better epitaph for Andrew Carnegie would be: "Here lies a man who, deeming it a disgrace to die rich, devoted his millions while alive the diffusion of knowledge among the people."

INVENTOR OF THE BICYCLE DIED IN POVERTY.

Baron Von Drais, who invented the bicycle, died just 50 years ago, in Heidelberg, Germany. He spent his large fortune in trying to interest manufacturers in the device and died penniless and broken hearted. He made the first bicycle, which though extremely crude, was the beginning of a new era that has led to the invention of the rubber tired vehicle and probably the automobile. The first bicycle was almost entirely of hard wood. The rider's seat was adjusted to a clumsy, long narrow board, under which were the two wheels, the hubs of which supported each



four wooden forks. The rider propelled the machine by quickly touching the ground with his feet.

Drais had his machine patented in Baden and France. He secured approving letters from crowned heads and came to America with it. Little, however, was ever heard of it afterward.

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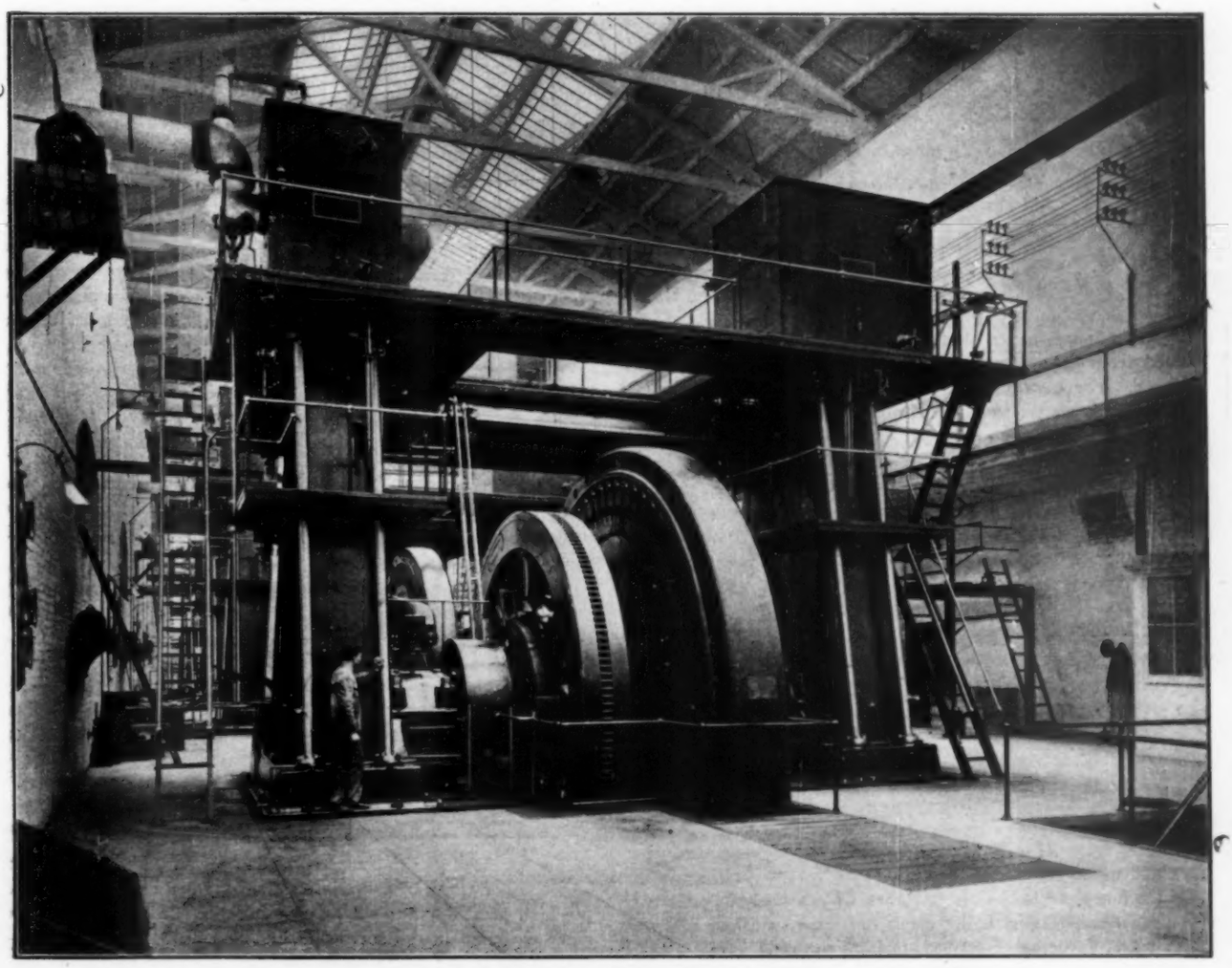
In Europe ten out of every 1,000 people are living out of their own country; in America 137 out of every 1,000, while 300 out of every 1,000 Australians were born in some other part of the world.

MAMMOTH POWER STATION IN SAN FRANCISCO.

Four Mammoth Engine Units That Develop 2,400 Horsepower Each.

California has other big things than trees, mountains and prunes. Among them is the new power station of the Independent Electric Light & Power Co., of San Francisco. The Journal of Electricity of that city gives a complete account of the plant. We illustrate one of the big engine units, of which there are four, beside several smaller ones. The large engines are cross compound with cylinders 28 and 58 inches diameter and 48-inch stroke. At 165 pounds steam condensing and 116 revolutions per minute these units each develop 2,400 horse-power. As shown in the illustration the flywheel and generator are between the engine frames. A. M. Hunt installed the engines, and Chas. C. Moore & Co., the steam equipment of the plant.



2,400-Horse Power Engine, San Francisco.

America sells nearly three times as much as she buys; Germany buys $250,000,000 worth more every year than she sells, while Great Britain last year actually bought twice as much as she sold.

Peru holds the record as a mining country. She has 2,500 mines from which 70,000 workmen dig gold, silver, sulphur, coal, phosphates, quick-silver, borax, copper and lead.

EMPEROR WILLIAM'S NEW YACHT.

Arrangement of Interior Suggested By the Kaiser Himself—Will Cost $175,000.

Since approving the designs and plans Emperor William has given many suggestions through the German ambassador in the construction of his yacht at the shipyard of Townsend & Downey, N. Y. The yacht will cost about $175,000, and will have a speed of about 16 knots. The measurements are 160 feet over all, 120 feet on the water line, 27 feet beam and 15 feet draught. The yacht is what is known as a fore-and-aft schooner rigged, keel type and flush deck. The masts are of Oregon pine, 105 feet in length. The longest boom will be 85 feet. The deck finishings are of the finest teak, while the saloons and cabins are finished in mahogany and other hard woods. The interior arrangement was suggested by the Kaiser himself to the designers, Gary, Smith & Barbey. The main saloon will be exactly in the center of yacht and will measure 20 by 27 feet. Aft of this will be the Kaiser's private stateroom and aft of that four private staterooms for guests. Forward of the main saloon are the officers' quarters, then the owner's gallery, further forward the crew's gallery, and still further the crew's quarters made to accommodate 20 men.

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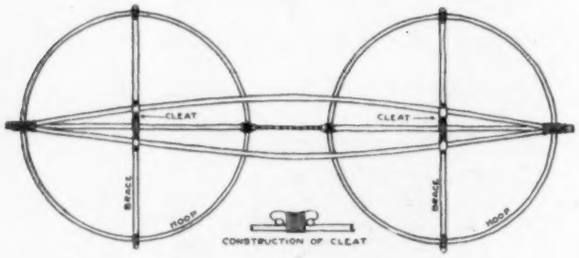
HOW TO MAKE SKATER S HAND SAILS.

Simple Device That Enables the Skater to Go as Fast as the Wind.

Skatng with the aid of hand sails is man's nearest approach to flying. A person may literally attain the speed of the wind. No locomotive. automobile or other machine propelled by either electricity or steam can make anything like the time of the winged skater. He has been known to travel at the rate of 100 miles an hour. And the beauty of the sport is that it is not attended with any danger. There is no record of a serious accident.

One of the most easily handled sails may be made from two



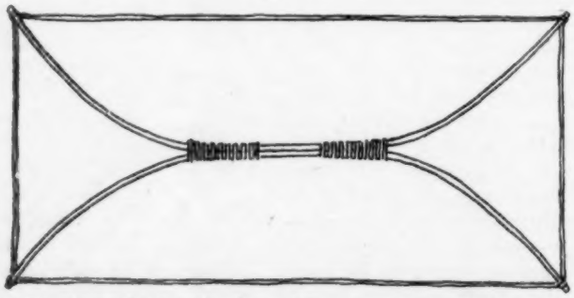
large thin hoops, about four feet in diameter. They may be obtained from a hogshead in which crockery and glass ware are shipped. For each hoop select a piece of strong cane about ¾ inch in diameter, to constitute the fore and main masts or cross-yards. Extend these across the center of the hoop and fasten each end firmly to the hoop's sides. For the middle of each cross-spar make a cleat and lash it on firmly.

The main spar should also be made of two pieces of strong cane, each about 9½ feet long. Bind them together at each end so that the large end of one is fastened to the small end of the other.

Next comes the attaching of the sails to the separate masts. The sails should be made of strong sheeting or thin canvass. Tack the cloth to the hoop on the inner side after the cloth has been wrapped around the hoop two or three times.

Now the main spar should be attached by springing it apart and slipping the cleats of the cross spar between the two pieces. Bind the inner sides of the hoops tightly together by means of a very strong double cord as shown in the figure. Then your sail is ready for the ice pond. See that your skates are securely fastened, raise your sail and you will skim along the ice as lightly as a bird on the wing. With a little practice you will learn to tack and guide yourself as desired.

If the hogshead hoops cannot be easily obtained the sails may be made equally effective by using the main spar and fore and main masts as herein described, making the sails square shaped instead of round and leaving off the hoops. In this case the sails



should be securely bound with strong tape. Attach a corner to each end of the cross spar, and a corner to the outer end of the main spar. The remaining corner of each then appears opposite to each other and should be fastened together by strong cord in the same manner as the hoops. In this case the sails may be left off until after the frame is entirely put together and then fastened on to the spars by buttons.

A more simple sail may be made according to the plans illustrated in Fig. 2. It is made by binding together in the center the halves of two strong hogshead hoops or two bent poles are better. If possible the sail should be about eight feet long and four feet wide. Fasten on the sail at the four corners. The rig will convey two persons and is more easily constructed than any other.

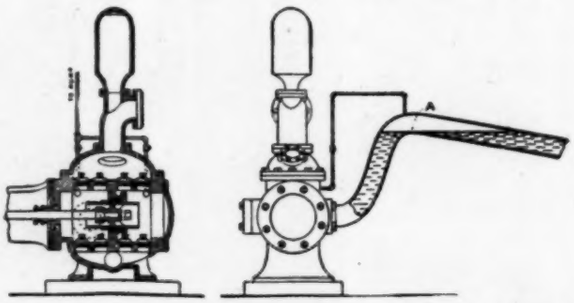
INDICATES IRON OR STEEL IN THE EYE.

Magnet With a Mirror Attached, Suspended By a Fibre ot Silk.

The magnetic needle for testing the presence of particles of iron and steel in the eye, is coming into general use. Dr. Thomas R. Pooley, of New York, exhibited an improved instrument of Hirschberg before the New York medical society and said that he was the first to employ the magnetic needle for this purpose. The machine is similar in construction to the reflecting galvanometer, a magnet with a mirror attached, being suspended by a fibre of silk. The reflected light falls on a scale and the deviation of this spot of light from the zero mark points to the presence of a piece of iron or steel in proximity to the magnet.

AN AIR TRAP AND ITS CURE.

A writer in Power describes a big water pumping plant he was called to inspect. In setting up the machine a mistake was made in leveling, which brought the suction pipe about three feet too high where it should join the pump. The pipe was 36



inches in diameter, and so rather than lower it they decided it was cheaper to make a special casting and incline the pipe from the high point down to the pump connection, thus leaving a high place or hump in the suction pipe. The result was the formation of air in the hump which caused the engine to run so fast as to be very dangerous.

To remedy the trouble it was decided to drill and tap the highest part of the hump, and lead a pipe from this point to the pump, and then branch into each end of the pump chamber, putting check valves at each end to prevent the water being forced back into the suction on the discharge stroke of the pump. This cured the trouble completely, as the air was withdrawn as fast as it collected in the hump, and the only drawback was the clatter of the check valves, but as the water company was at fault they could not say very much against it.

The street lights in Berlin, are to be lighted automatically and simultaneously by means of an electric attachment. The current will be switched on from the central station and a spark will ignite the gas which will be turned on by special apparatus.

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FIRST LOCOMOTIVE BUILT 100 YEARS AGO.

One Hundred Tools, Says McDowell, Are Due From Every Locomotive March 24.

The locomotive will be 100 years old, March 24, 1902. On that day, says Malcolm McDowell, every locomotive in the United States should be permitted to give 100 triumphant toots. Every machine on the rails, he says, should be decked out in the gayest of bright bunting. March 24, 100 years ago, Richard Trevithick and Andrew Vivian applied to the English government for a patent for steam engines for propelling vehicles. This machine was the first high pressure locomotive ever made. The vehicle, as a matter of fact, was a road locomotive and automobile, but it was the original high pressure locomotive and it was built March 24, 1802.

This machine was a four wheeled vehicle. The two forward wheels were small and their track was narrower than the larger rear wheels which carried the boiler and engine. The cylinder was horizontal and was placed behind the rear axle. The boiler was caried beneath the cylinder, which was practically part of the boiler. To prevent loss of heat by radiation, the boiler was inclosed in a clay-filled case. The lower part of this case formed the fire-box or furnace and the flame and heated air circulated around the boiler at its upper end and then passed into the chimney. The specifications refer to bellows for the fire and a feed water pump for the boiler.

Trevithucks engine started as much of a craze then as has Dumont's airship of today. Scores of road engines were built; scores of queer combinations of boilers, engines, toothed and pronged wheels, levers, pushers and cogs were put together and tested. But in 1811 Blenkinshop built a practical locomotive which was successfully operated for hauling coal cars on a mine railroad near Leeds, England.

George Stevenson, generally regarded as the "father of modern railroad," saw what his predecessors had failed to notice—that the "traveling engine," which the locomotive was then called, to be a practical success should have a good level roadway on which to travel. He invented the T rail. He figured out the advantages of easy grades and wide curves, of "cuts" and "fills," of ballast and firm elastic roadbed. He succeeded in convincing the directors of the Stockton and Darlington Railway, the first real railway ever built, that his ideas were correct and the road was built according to his plans, in 1824.

MACHINE FOR SPRAYING PAINT.

Looks Like an Automatic Band Instrument and is Worked By Compressed Air.

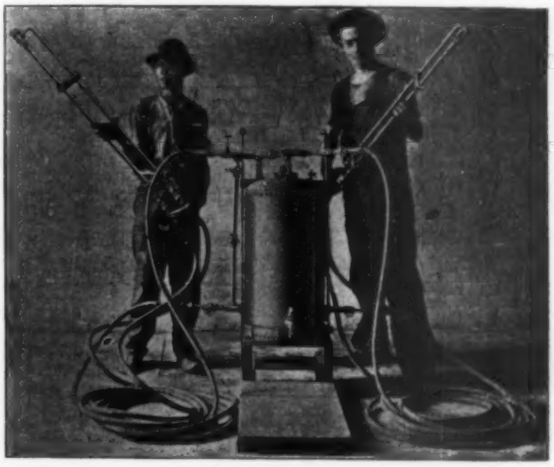
This machine is not a mechanical trombone, but a device for spraying paint on cars and walls of buildings. It is known as a double-hose painting machine and is one of the largest ever built. It contains a reservoir for holding a large supply of paint. It is of pneumatic construction and so arranged that two men can operate a single machine at the same time.

The pneumatic painting machine is an American invention and is a natural product of Yankee desire to do things in a hurry. The old style of hand painting was too slow for American railroads and machinery was made to do the work. It is a won-

CO-OPERATIVE LOCAL TELEPHONES A SUCCESS.

Great Reduction in Rates Follow the Organization of Companies in Wisconsin.

Small towns along the valley of the Wisconsin river have successfully organized several co-operative telephone companies. One is at the town of Grand Rapids, Wis. It was organized at the time the subscribers were forced to pay $48 and $36 for business and residence telephones, respectively, and when their petition for lower rates was refused. The subscribers, says the Tribune, became the equal and only stockholders, each one holding a $50 share, which was sufficient for the installa-



PNEUMATIC PAINTING MACHINE.

tion of one instrument. The old company had operated about 70 instruments. The new company started with 83. The charges were fixed at $27 for business and $12 for residence connections. They were reduced to $18 and $3. Eeach subscriber relinquished any dividend on the $50 share of stock. The old company, reduced to desperate expedients, offered 'phones "rent free for a period of three years." This offer was looked upon as calculating and insulting, and the old company was driven from the field, leaving the independent company in sole possession. The latter now has about 300 instruments, or one to every 17 inhabitants. There are no "party" lines, the metallic circuit equipment is everywhere, and the stock has been raised to $15,000. With other similar companies that have been organized a population of from 20,000 to 30,000 people is served by co-operative local telephone service.

Doctors in Sweden never send bills to their patients. They cheerfully accept whatever sums the patients choose to give them.

Easy Electrical Experiments

FOR BOYS.

By L. P. Dickinson.

ELEMENTARY STUDIES IN ELECTRICITY.

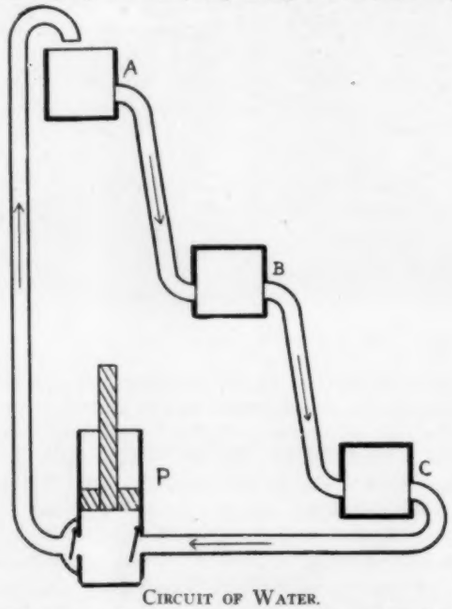
Chapter VIII. Electrical Units.

One of the most important points in the study of electricity is to get accustomed to the use of electrical units, and to learn how to use them intelligently. The chief trouble arises from the peculiar nature of the agent with which we are dealing, and the peculiar names given to the units.

It is clear to every one who has experimented at all with electricity, that there is something in every electrical circuit which forces the current to flow through that circuit. That which causes the current to flow has received the name electro-motive force (E. M. F.). Now to express the value of any electro-motive force, we must have a unit of electro-motive force. This unit has received the name Volt, in honor of Volta, one of the early experimenters in electricity.

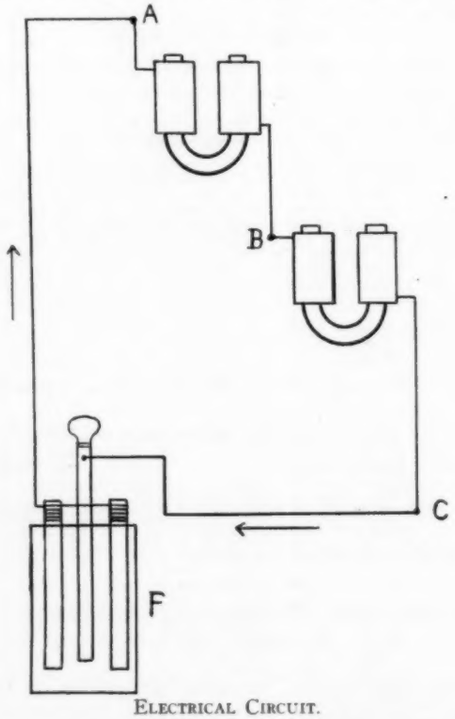
Now the very existence of this electro-motive force proves that there must be something about an electric conductor by reason of which it tends to oppose the passage of the current. If there were no opposition to the passage of the current, there would be no need of an E. M. F. to cause the current to flow. This property which all bodies possess to a greater or less degree, of resisting the passage of a current, is called resistance. The unit of resistance is called the ohm, in honor of Dr. Ohm, a celebrated German scientist.

An electro-motive force acting upon a given resistance causes a current to flow through the latter. Now this current may be strong and it may be weak, depending for its value upon two



Circuit of Water.

things. If the E. M. F. be high and the resistance low, the value of the current will be large. But if the resistance be very high, the current may be very small even though the E. M. F. be large. So we see that a circuit with a high E. M. F. in it will not necessarily produce a strong current, unless the resistance be low The number of volts in a circuit gives us no idea of the strength of the current, until we know the resistance of the circuit. The strength of the current is expressed in amperes. There is a simple law connecting the values of current, E. M. F. in volts, divided by the resistance in ohms. This is a very important law and every student of electricity should become familiar with it. Thus, suppose that we know the resistance of an incandescent lamp to be 220 ohms. What current will flow through it when it is attached to a 110 volt circuit? According



Electrical Circuit.

to the rule just given the current is 110 divided by 220, or ½ ampere.

Very much the same conditions are met with in the circulation of water in the system illustrated in the accompanying figure, "Circuit of Water."

Suppose the tank A to be partly filled with water, and that a pipe connects it with B and C. Because of the difference in level between A and B or B and C water will flow downward through the system. There will be friction between the moving water and the pipes and the rate of flow of water will depend not only upon the difference in level between the tanks, but also upon the frictional resistance met with in the piping. At P is a pump to raise the water from C back to A as fast as it flows down into C. What pressure must this pump exert? Clearly it must exert a pressure equal to that between A and B, plus that between B and C, plus whatever back pressure results from friction.

Now consider the diagram "Electric Circuit." It has been lettered to correspond with the hydrodynamic diagram just described. Current will flow from A to B through the connecting wire if there is a difference of potential (electrical level) between the two points. Similarly, there will be a flow of current from B to C, if B be at a higher potential (electrical level) than C. This flow of current will, however, be opposed by the electrical resistance of the conducting wires. To make the flow continuous, there must be something at P capable of forcing the current back to A again. The apparatus to accomplish this is an electric battery, which we have already studied. The power which it possesses of sending the current through the electrical circuit is called electro-motive force, and in the case just illustrated, is equal to the sum of the difference of potential between A and B plus that between B and C, plus whatever difference of potential is necessary to send the current through the remaining portions of the circuit including the battery itself.

Thus we see that difference of level in the case of a water circuit is very similar to the term difference of potential that we measure, as the electro-motive force in a circuit often has to be

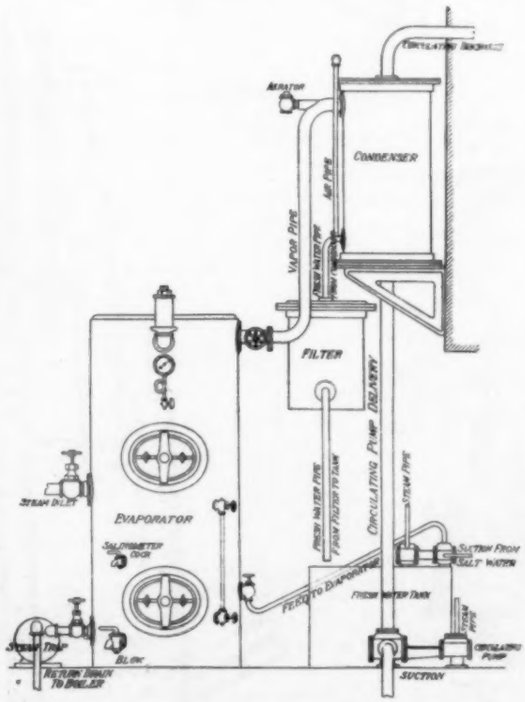
obtained by calculation. In the same way, frictional resistance to moving water is in some respects similar to electrical resistance, though the comparison must not be carried too far. And finally, the rate of flow of water through the system described, expressed in cu. ft. per second, is very similar in its significance to the term "strength of current" in an electrical circuit.

THE OCEAN FOR A WELL.

Making fresh water from sea water is regarded as one of the great achievements of the present age. Sailors famished from thirst and boilers of ocean vessels rendered powerless from using salt water are but memories of the past on up-to-date vessels equipped with evaporator and distillers.

The accompanying illustration shows a Quiggins Patent Evaporator, which is almost self-explanatory. The vertical steel shell to the left (the evaporator proper) is equipped with coils, which receive the steam from the main boilers. The coils are covered to a certain height by the sea water, which is fed into the shell by means of a small feed or donkey pump. The steam from the boiler in passing down through the coils, gradually gives up its heat to the liquid surrounding the coils, and converts it into vapor. By the time the steam reaches the bottom manifold, (two manifolds are bolted to the inside of the shell) it has been reduced to water, and in this form it is returned to the automatic trap to feed trap for boilers.

The constant evaporation, which leaves all the solids behind necessarily causes the precipitation of scale on the heating surface. The expansion and contraction of the spiral coils causes this scale to crack off nearly as fast as it accumulates and it is taken out through a lower manhole.



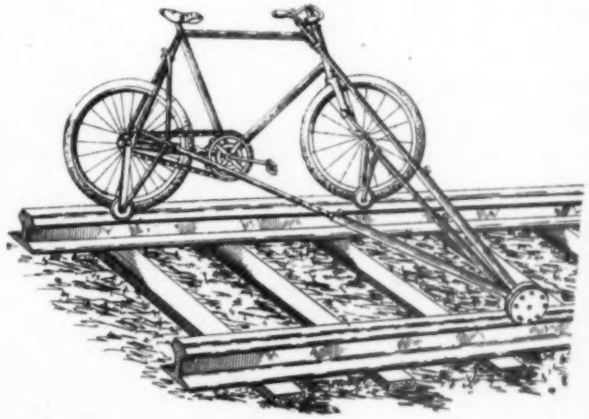
An automobile constructed by Edwin F. Brown of Chicago in 1887, the first built in the West, will be exhibited at the Chicago Automobile show which opens March 1.

"Josiah," asked Mrs. Chugwater, "what is a bucket-shop?" "It's a place, I suppose," replied Mr. Chugwater, looking impatiently up from his newspaper, "where they empty the water out of stocks."

RAILWAY BICYCLE.

Latest Invention Has Two Small Guide Wheels, Is Light and Attains High Speed.

Several types of bicycle for use on steam railroad tracks have already been built. We illustrate the latest, the invention of Chas. Gorneman of Cedar Valley, Utah. He has improved on previous wheels by the addition of two small guide wheels to run on the inside of the rail which supports the bicycle wheels proper. The machine is capable of very high speed, and being light can be instantly removed from the track upon the unexpected approach of a train.



MAKE SAUSAGE OF DOG FISH.

A Mid-Winter Enterprise That is Draining the Waters of America and China.

Making sausage of dog fish is the latest enterprise in China. So remunerative has it proven that a company has been organized for the purpose in Pekin and a factory has been established. Dog fish are caught and sold by the wagon loads and the sausage made therefrom are shipped to various parts of China and other countries.

Dog fish catching is also proving a great commercial pursuit in the United States in winter time. Because of the great quantities taken from the waters, the United States fish commission has been compelled to call a halt. The announcement has just been made that ice-fishing will be permitted only under the supervision of fish wardens. Mr. Cohen, president of the commission, said:

"Dog fish show a marked decrease since the demand for them as a food fish has made them a source of income to fishermen. They now bring 1½ cents a pound in the rough. They are being sold in the east ,under the names of willow cat, California bass and Grinnell cat."

WILLARD A. SMITH AGAIN HONORED.

Willard Adelbert Smith, of Chicago, has been honored by the Louisiana Purchase Exposition Company in being made director of the department of transportation exhibits. A similar position was held by Mr. Smith during the Chicago World's Fair. The French government bestowed on him the decoration of the legion of honor, in recognition of his efficiency at the head of the department of transportation and engineering exhibits for the United States government at the Paris exposition, and the official representative of the state department of the government at the international railway congress in Paris. Mr. Smith is the owner, editor and publisher of the Railway Review and has resided in Chicago for more than 30 years.

HAND MADE FLOUR IN THE PHILIPPINES.

Crude but Ingenious Devices Employed by the Natives in Working the Raw Product.

Hand-made flour is used almost entirely by the poor and middle classes in the Philpines and their manner of working the raw product while extremely crude is in many instances ingenious. The flour used by the wealthy is nearly all imported from the United States, and since the American possession it has proven a lucrative source of revenue.

Wheat and corn are both ground in crude devices to make bread for the natives. A writer for the American Thresherman in the December issue gives an interesting acount of the methods of converting wheat and corn into flour.

Fig. 1 shows a beating cylinder used for threshing purposes. It is a heavy log of wood, set with wood pins. Wooden pulley wheels at either end of the shaft carry belts which are run by various forms of motive power, usually by hand, for revolving the cylinder. The cylinder is incased and the product passed through by hand-feeding, receiving the action of the pins.

A device for separating the chaff is shown in Fig. 2. It is made entirely of hollow bamboo. The rod C is worked to and fro and the wheat is forced up into the tube E and out through the nozzle, from which point it is distributed over the channels, D D D. The interior of the main tube B is divided and the partition wall is fitted with valves made from caribou hide. The suction created on one side of the wall sends up the wheat to the pipe E while the draft on the other passes through the upper tubes, D D D; and the force of this air scatters the chaff. The separated wheat falls to the ground, being heavier, and is caught in mats.

Fig. 3 shows another device. The iron crank, carrying a series of pounding devices, is turned and the wooden pounders thump the wheat soundly at every revolution of the crank shaft.

In Fig. 4 the wheat is placed in the bag L. A tube suspended at the other end of the pole is filled with weights to balance the pole. The native grasps the rope above the bag and causes the latter to strike frequently upon the ground, which thoroughly loosens all particles.

Fig. 5 is an ingenious contrivance, the cogs all being of wood. Its object is to feed wheat to a mechanical grinding apparatus. The apron D is the only part that requires operation except the grinder-wheel which is run with a rope belt C. The shaft carrying the gear F, is fitted with a crank A at the other end by which it is turned. The shaft runs in wood bearings not shown in the illustration. The

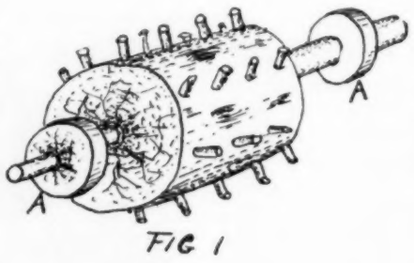


FIG 1

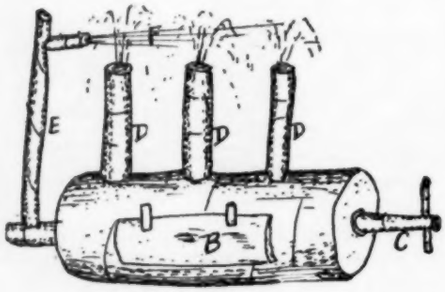


FIG 2

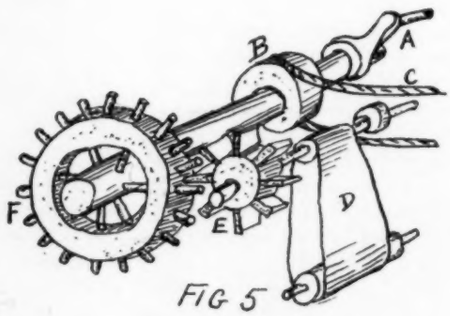


FIG 5

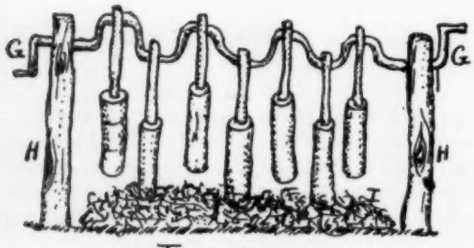


FIG 3

FIG 6

FIG 8

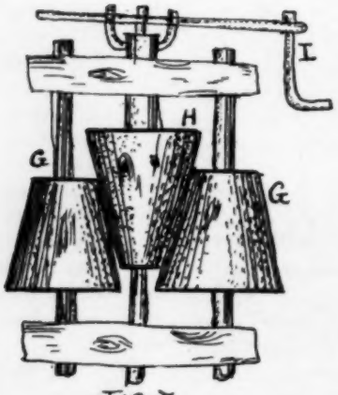


FIG 7

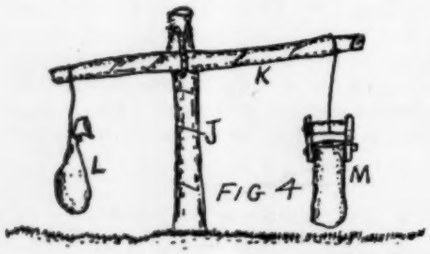


FIG 4

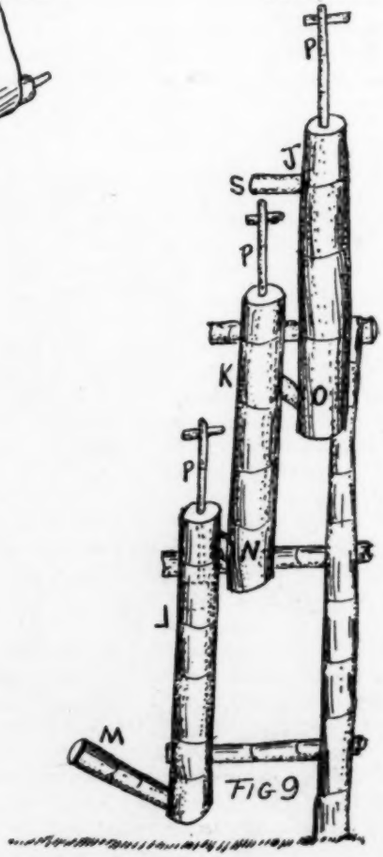


FIG 9

band C drives the grinder and the band is given the required motion from the wood wheel B.

Fig. 6 is a wooden scoop fitted with a wood handle.

Fig. 7 is a grinder made of iron-wood. The bearings sustaining the lower portion of the cone shafts is usually secured to posts sunk into the earth. The bar passing through the center cone shaft is pushed around by two or more natives or sometimes by a water-buffalo.

Fig. 8 is a device used for dipping up the product. It is made of a bamboo tube.

Fig. 9 is an elevator. The tubes are often quite lengthy. Derrick-like structures are used to support the outfit, which is used for exposing to the winds for winnowing. The stock is sucked in at M through tube L to N by the action of the suction rod connecting device P, which is worked by a native. The suction is developed by a flanged head-piece on the inner end of the rod, fitted with hinge passage-flaps, so that the air is regulated in the process of lifting the stock to the proper level. The same proceedure operates in the tube K which is performed by the rod P, and brings the stock to the level O. Thence the stock is worked up to another level to the outlet S, of tube J, by a native on a platform level with the rod P.

FOR ACID LETTERING.

Editor Popular Mechanics: Please tell where I may get tin foil and paper letters for acid lettering on glass, and what are the best methods for using the same. Also tell me what glue to use for gluing pieces of glass edgeways, so that they will stand a large strain.—A. Dietrich, 435 Otto street, Chicago.

(We will inform you by private mail the name of a reputable firm from which you may obtain the material and also the name of a good brand of glue that will answer your purpose.)

Danger in handling good acids makes it almost impossible for a person to perform the task you contemplate without having a well-equipped establishment. Lead foil and not tin foil must be used for your purpose. Tin foil is usually used as an ornamentation, on the back of glass letters, as imitation of chipped glass. Lead foil is used almost exclusively in process work. Asphaltum, which has lately come into use for this kind of lettering, will probably answer your purpose better than acid. It may be used by filling in around the letters. The Venice asphaltum is considered best for the work.

The navy department has added six months more to the four years' leave of absence granted to Lieutenant Peary for the purpose of enabling him to make one more attempt to reach the pole. Should this fail he will abandon his Arctic researches.

HOW CHICKENS WERE RAISED 2,000 YEARS AGO.

That the ancient Romans were not so far behind people of the present day in the matter of building hen houses and raising chickens is attested by the discovery of an article from the pen of Liunius Moderatus Columbella, written in the first century, A. D., an account of which is contained in the American Poultry Journal. Columbella states:

"A henhouse should be built in the part of the farm that looks to the sunrising in the winter, and if built near an oven or the kitchen that the warmth and smoke may reach them, it will contribute very much to the health and comfort of the fowls. Husks and the seed of grapes from the vine-press make good food for chickens but should not be given except during the time of the year that they are not laying.

"Dry dust and ashes must be placed by the walls, or under some shelter that the fowls may have wherewithal to sprinkle themselves, for with these things they clean themselves. The best time to set a hen is when the moon is increasing from the 10th to the 15th. If all mails are desired set only the pointed eggs; if all females, set only the round eggs. When the chickens are hatched you must suffer them to stay one day in the nest with their dam, and keep them from food and water. The next day let the chickens be placed on a sieve and fumigated with sprigs of pennyroyal. This will prevent them from having the pip. After this shut them up with their mother in a coop and moderately feed them on barley meal or with the flower of wheat moistened with wine. They must not be allowed to wander far from the coop when very young and care must be taken that they be not blown on by serpents, the breath of which is so pestilential that it kills them all. This may be prevented by burning hartshorn or woman's hair outside the coop."

"What a crowd of lady shoppers there are in the shoe department to-day," remarked the saleslady. "A marked down sale, I suppose."

"Yes," replied the salesgentleman, "all the ladies' number sixes are marked down to number four, and so on."

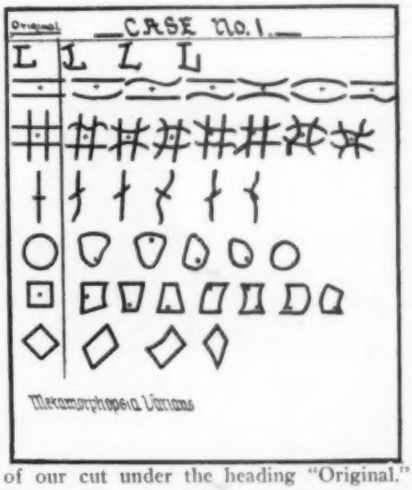
"Did you ever see a hen lay an egg?" inquired the gruff joker in his deep basso-profundo.

"No," replied the dainty little voice of Miss Ready Repartee, "but I once saw a woman lay a carpet," and she giggled as if she had said something funny.

Norway's population is the smallest in Europe compared with her area. Each of her inhabitants could have 40 acres of land, while the Briton would have to be contented with less than an acre.

AN INTERESTING EYE TEST.

Dr. W. H. Dudley, Easton, Pa., reports in the Journal Am. Med. Assn. some interesting results of testing defective eyes. We select one of these diagrams as an illustration of a good eye gone wrong. The patient was instructed to look through an instrument at the characters found in the left



of our cut under the heading "Original." He then traced with pencil on paper the form in which these characters appeared to him. A comparison of the original and the copies indicates to what extent the eye was defective.

A STRONG STOVE PIPE.

The American Artisan illustrates an inventor sitting on some of his own stove pipe, which is strong enough to sustain

a weight of 160 pounds. Three pieces were put together in the usual manner to form this novel seat.

STATE RIVALRY.

"You talk about natural resources!" scornfully exclaimed the Maine man. "Why, last year the catch of lobsters on our coast was over 7,000,000!"

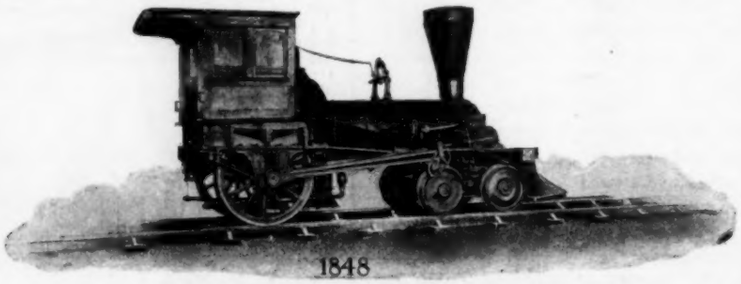
"And your state is full of 'em yet!" fiercely ejaculated the New Hampshire man.

Aldermanic candidates in Reading, Pa., who employed automobiles to carry voters to the poles, were all elected by large majorities over those who used carraiges. This is thought to permanently establish the automobile as a vote getter.

FIRST ENGINE TO RUN WEST FROM CHICAGO.

It Was a Diminutive Freak, Compared to the Powerful Locomotives of To-day.

Sway-backed, weak and clumsy, like a deformed dwarf in comparison to the powerful and graceful locomotives of the present day, was the first engine that ever ran west from Chicago. That engine is still in existence. It is called the "Pioneer" and is preserved as a priceless relic of early railroad traffic in the West.



FIRST ENGINE THAT EVER RAN INTO CHICAGO.

The "Pioneer" was landed in Chicago from the brig, Buffalo, in Ocotober, 1848. She made her first trip over the first railroad west from Chicago Nov. 20 of the same year. The road was the Galena & Chicago union, now the Chicago & Northwestern, and at the time this first engine was installed into service, only ran as far as Des Plaines river, ten miles. The first trip was the occasion of a grand jollification in Chicago. People came from miles away to witness it. The cargo consisted of a wagon load of wheat brought to Chicago from Des Plaines, being the first shipment of the vast resources of the Northwest to enter Chicago. The entire equipment of the road at that time consisted of five flat cars, one box car and an engine. The road was completed to Elgin, Feb. 1, 1850, which was the occasion of another great celebration and an excursion when hundreds of Westerners made their first trip by rail. The extension to Freeport was completed in 1853.

It was decided to build a more direct route to the Mississippi and the Dixon Air Line was constructed in 1854, which with connections, furnished the first railway line between Chicago and the Missouri river. There it made connection with the through transcontinental route opened May 10, 1869. The Chicago & Northwestern Railroad was organized June 6, 1859. From the original ten miles with its one hunchback locomotive has grown the present system with a mileage of 9,000 miles of main line; nearly 2,000 locomotives and about 60,000 cars, passenger and freight.

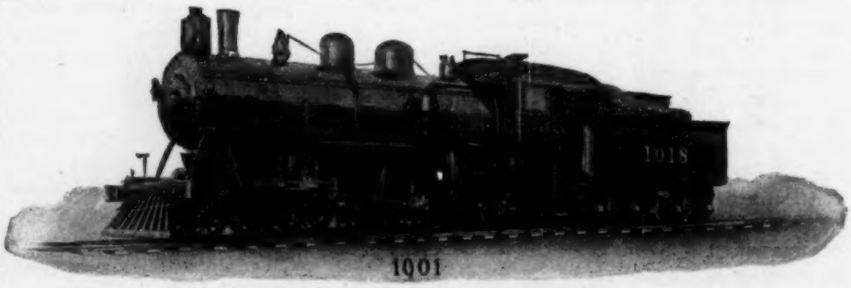
The announcement is made that automobiles are to supplant carrettes in Chicago.

FITTING PLANER KNIVES.

In my own limited experience I find that in fitting knives of any kind for the planer they should be what I term hollow-ground, not to a very thin, wire edge, but metal enough left that when the file is applied it will leave a keen cutting edge, with stability enough to stand the required pressure, and should be set at as great a slant as the shape of the heads will permit. In regard to surfacing knives the same rule holds good, says a writer in Wood Worker.

In grinding long knives especially, the grinding machine, and preferably a suitable grindstone, should be used. By this means we maintain a true bevel and the hollow grinding greatly assists the filer to keep his knives straight on the edge, for the knife should go to the grinding machine before the hollow is entirely filed away. More grinding and less filing is a matter of economy in all classes of wood-cutting machinery.

It required twelve men to carry to the grave the casket containing the remains of Dennis Leahy of New York, who weighed 700 pounds. Leahy's disease was due to fatty degeneration of the heart. To save his friends trouble the man moved near the cemetery a short time before his death so that the casket had to be carried but a short distance.



A NORTHWESTERN LOCOMOTIVE OF TO-DAY.

CHOKING UP THE ENGINE.

"A fourth of what we eat keeps us; three-fourths we keep—at the risk of our lives."

In England electric signs are not permitted if worked by flash lights. The light must be increased gradually from nothing to greatest intensity.

WHAT CAUSES BOILER EXPLOSIONS?

One of the causes of explosion seldom thought of is through the safety valve. One must bear in mind that water is practically a solid; you have water in a boiler and you boil it. It boils at 212°. Now you increase the pressure and it will take a much higher temperature to make it boil, this increases the density. If you release the pressure too suddenly you begin to stir up trouble; if the release continues every drop of water in the boiler will almost instantly come to a boil owing to quick reduction in pressure and corresponding temperature. When the drops boil they take up seven times as much room as they did previously. This causes what is known as water ram. Now let the safety valve stick, say until the steam raises 10 or 15 pounds above the set of the valve; finally the valve releases, then there is an awful rush of steam with a corresponding eruption of the water inside. A condition which very few boilers are able to withstand, consequently an explosion occurs, says the Practical Engineer.

Recently a government test was made of a boiler; steam was run up to 600 pounds pressure and the boiler just went humming like a top, but it didn't burst. The next day they ran steam into her up to 300 pounds, and then the engineer briskly pulled the safety valve, and when the men came out of the safety tower there wasn't a piece of the boiler in sight; it simply blew into fragments, thus proving that water ram will cause a boiler to explode with the most disastrous effects.

Judge Arnold of Philadelphia has ruled that suicide is no crime and that a man has a right to kill himself if he so desires. Herbert Wright, who was arrested for attempting to take his own life, was released by the jurist.

NO, INDEED.

Dowie coughed up $178,000 and Zion is at ease again. It wouldn't really have looked well to see heaven in the hands of a receiver!—St. Louis Globe-Democrat.

There are more street cars drawn by horses in New York City than all the other cities of the United States combined.

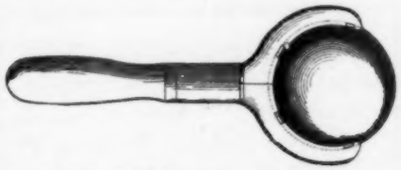
FOR THE MADAM.

WOMAN'S SUFFRAGE IN FOREIGN LANDS.

Women teachers in France elect women members on all boards of education. In Sweden women vote for all elective officers except representatives; also indirectly for members of the upper house. In Ireland the women vote for the harbor boards and poor law guardians, and in Belfast for municipal officers. In Russia women householders vote for all elective officers and on all local matters.

MASSAGE BALL.

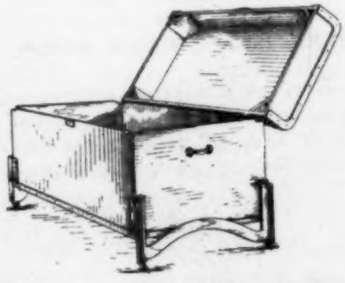
This somewhat formidable looking weapon is intended for use by massage operators. The operator grasps the handle firmly and with as much pressure as desirable



moves the instrument over the body, the ball being free to roll in all directions. It is used in the development of muscles. The operator at least is sure of muscular benefit.

CASTOR SUPPORT FOR TRUNKS.

Who has not tugged, and sweated and torn the carpet in an effort to move a trunk which had been packed to overflowing? . The illustration shows the idea of a Detroit inventor, who sets the trunk in a



neat iron frame permanently mounted on castors. It is intended for trunks kept in the house and not for use at railway stations.

ANXIETY.

Coal Dealer (anxiously)—Hold on! That load hasn't been weighed. It looks to me rather large for a ton.

Driver—'Taint intended for a ton. It's two tons.

Dealer—Beg pardon. Go ahead.—Tit-Bits.

FENCES FOR PHONES.

Down in the Indian Territory the wires of fences for railroad rights-of-way have been used for telephone purposes by T. P. Martin, who claims that he obtains as good service as could be desired. He says that this should be a good suggestion to the inaugurators of independent telephone systems. Mr. Martin lives at Marlow, I. T. In the Electrical Review he states:

"I have been using such a line for more than a year and have found the service of the best and very little trouble. A tip to the bridge or section gangs working such sections of track along the road where the wire fence is used is usually all that is necessary to keep the wires in first class condition. If a metallic circuit is wanted the top wire of each fence on the two sides of the railroad should be used. At all crossings the wire should be raised from the fence and poled so as to be at least 14 feet above the crossing to allow free passage of hay wagons and such heavily-laden vehicles. At culvert and cattle gaps the same plan should apply. I cannot see why the railroads, themselves, do not use these wires for telephones. In dry weather they will give good service up to 100 miles. In Texas I had a line about 20 miles long which I used for both telegraph and telephone purposes and which gave good satisfaction."

OLDEST HOUSE IN THE UNITED STATES.

In a narrow street fronting the United States reservation in St. Augustine, Florida, is a queer looking two-story structure, originally built of stucco, which lays claim to a wonderful amount of sentimental associations. It is known as the oldest house in the oldest street of the oldest town in the United States.

HOW TO SOLDER ALUMINUM.

Prof. E. Wilson gives the following as the recipe for a good aluminium solder: 28 lb. block tin, 14 lb. phosphor tin—10 per cent phosphorus—3 1-2 lb. lead, and 7 lb. spelter. The following instructions should be followed when soldering aluminum; Clean off all dirt and grease from the surface of the metal with benzine, apply the solder with a copper bit, and when the molten solder covers the surface of the metal scratch through the solder with a wire brush, by which means the oxide is broken and taken up. Quick manipulation is necessary.

Congressman Cummings has introduced a bill providing for the coinage of 2½-cent pieces. The innovation, he says, is demanded by the present conditions of trade.

Smoking is perimtted in the prisons of Belgium as a reward for good behavior.

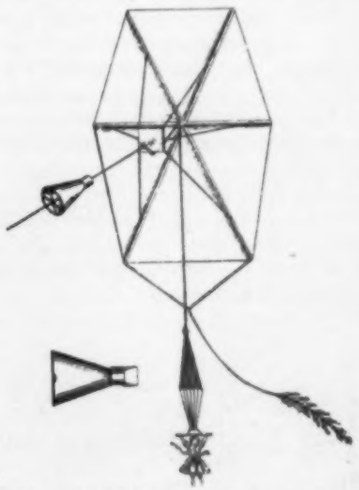
DOUBLES THE HARDNESS OF STEEL.

Discovery By a German High School That May Revolutionize Metal Industry.

The Technical High School at Charlottenburg, Germany, has invented a new method of hardening steel which it is claimed threatens to revolutionize the metal industry. The inventor is Giebeler, a small manufacturer of Mecklenburg. By the new process all kinds of iron can be given strength and hardness double that of the Harvey, Krupp and Boehler processes, in spite of the fact that the cost of production is reduced 50 per cent. Projectiles fired against a .305 inch sheet of steel produced by the Giebeler process, penetrated only to the depth of 1 millimeter, or .039 inch. A similar sheet of Krupp steel was completely penetrated. With sword blades of this material, says a German paper, other sword blades can be shivered as if they were made of wood. A representative of Mr. Giebeler will come to America to bring the discovery before the attention of the great steel kings of America.

KITE ATTACHMENT.

A man in South Dakota who still enjoys flying kites has worked out a simple device by which he can release a small parachute sent up on the kite. The device consists of a small sharp knife mounted on a cone through which the kite string is fed out until the kite is at the desired height. Then the cone is released and carried swiftly to the kite by the wind. On



reaching the kite a string is severed which supports the parachute which then falls. A doll or toy figure or other article should be attached to the parachute.

Through a decision of the supreme court the Illinois Central railroad has established its claim to 53 acres of land valued at $10,000,000 along the lake front in Chicago.

SIMPLE PHOTO ENLARGING DEVICE.

Artificial Light Apparatus Which Will Make Pictures Five Times Their Original Size.

A novel and inexpensive process of enlarging photographs by artificial light with the aid of an ordinary camera is described by W. A. Merriam in the Photo-Beacon of February. Mr. Merriam says:

"First I secured a box, then filled my bike-lamp up with carbide and set it inside I marked with a pencil where the center of

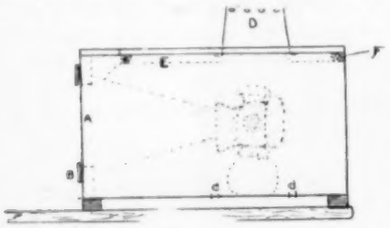


FIG. 1.

the light came, and around the lamp as it sat on the bottom of the box. I then cut a hole in the end of the box (marked A) 6½ by 4½ in. in size,so that there would be ¼-inch margin all round on a 5 by 7 plate. With the aid of thin slats, obtained from the top of a grape basket and a cigar box, I made a slide to hold a 5 by 7 plate. (See B.) Strips of wood, F, were put around the inside of the cover to prevent it from sliding about, while keeping out the light. In the top above the lamp I cut a hole and therein inserted a 3-pound lard pail, D, upside down. It was made fast by cutting slots in the rim and turning the strips back after the pail had been inserted. I next cut an old ferrotype plate to the right size, and made a hole in it where it would come underneath D, and tacked it on to the cleats, as shown by the dotted line E. I made a row of half-inch holes around the bottom of the lamp to let in air, and a cleat under each end of the bottom of the box so that these holes might not be closed up. A board was nailed on the bottom so that it would stick out far enough in front to permit the camera to sit firmly on it. A sheet of ground glass was used between the negative and the lamp to diffuse

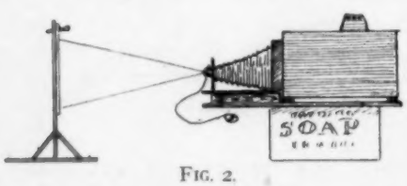


FIG. 2.

the light. To hold the paper I broke up an old easel and mounted it on a piece of board at the bottom, and nailed to it an old molding board. The box should be painted black inside. Any light which gets out between the camera and the box can be shut out by wrapping the focusing point around the box at that point. I used a ray filter in determining where to put the paper. With this over the open lens, the paper is safe and you can focus just as well

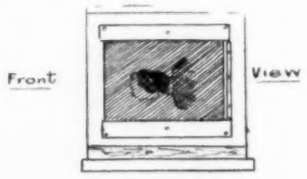


FIG. 3.

as though it was not on, and in this way you can tell just where your picture is going to come."

THE PASSING OF THE MULE.

Where would the modern street railway have been but for the mule? If Christopher Columbus was the first American advance agent, surely the mule can also lay claims to having been the pioneer of the street car. This fact has been duly recognized with typical Southern generosity at El Paso, Tex., where the trolley has just gone into operation, says the Street Railway Journal. On the first car that went over the road stood a little brown mule, and painted on a long banner at the side were the words: "Reward of thirty-five years of faithful service." The reward seems rather scant, if it consisted in one deadhead ride, but we are glad to understand that Mandy is now let out to grass, only to be called upon when the motors happen to break down. We hope that some day the grave of the first mule that ran the first American street car will be duly dignified with a monument. Less deserved memorials are in existence. The only trouble would be in locating the mule.

PUNCHING RAILS IN TRACK.

The ends of the rails of an electric railway track are connected by a piece of copper to allow the electric current to flow through the rails. These copper strips, or pieces of large wire, are called rail bonds. To fasten them in the rail a hole is usually punched at the rolling mill. Frequently such holes must be made after the rail is laid in the track. This is done by boring with a portable drill operated either by hand or with a very small electric motor. The Street Railway Journal for Feb. 15 describes a new device, easily portable and which punches such holes up to ⅞ in. diameter, by means of a lever worked by hand. The hole can be punched in much less time than one can be drilled.

"Did yez show Casey, the conthractor,the Wash'n't'n monnymint?" asked Mr. Rafferty.

"I did," answered Mr. Dolan; "an' he wor deeply imprissed."

"Phwat did he say?"

"He said it wor the tallest one-shtory buildin' he iver saw."—Washington Star.

MONUMENT TO THE POTATO IN GERMANY.

Historical Sketch of the Most Staple of Vegetable Foods.

"Here in the year 1747 the first trials were made with the cultivation of the potato."

Such is the inscription on a monument to the potato, which has just been discovered in the dense undergrowth of the so-called Brandhai of the Upper Hartz in Germany. It is a granite block about 7 feet high, resting on a stone pedestal. The inscription is on an iron tablet attached to the granite.

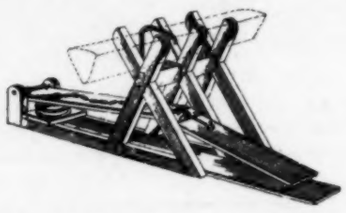
This monument marks the introduction of the potato into Germany. While the vegetable was not favorably received by the German peasant, it had a great friend in the king, Frederick II. He was obliged to use forcible measures to get the people of Pomerania and Silesia to plant it. The action of the Hartzers in voluntarily adopting the plant was evidently thought worthy of a memorial.

The potato is a native of South America. It was introduced into the British dominions by Sir Walter Raleigh in the 10th century.

The British experimentor did not, however, know much about the plant. When the vines were nicely grown he gathered some, boiled them as one would other "greens", and nearly died from eating the strange food. The rest were allowed to grow as a curiosity. In the fall the gardener pulled up the dead vines and made a bonfire. In the ashes he discovered one potato which had come up with the roots, and which was nicely baked. This was tasted cautiously and found pleasing. Search was then made for more potatoes which were found in plenty, fully grown.

HARNESSED THE SAW HORSE.

Those of us who recall boyhood days when we tackled wood piles that looked as big as Mt. Tom, will appreciate the attempt of a New Yorker to make his stick of cord-



wood stay where it should. The hook is held down by a chain fastened to a pedal board which releases by means of a spring when the sawyer steps off.

The exportation of American automobiles last year amounted to $300,000 and the imports to $90,000.

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CONSERVATISM.

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As jaunty as kin be,
Old-fashioned ways is good enough
Fur Mary Jane an' me.
Fur I kin drive with jes' one hand,
An' Mary won't complain—
A hoss an' buggy fills the bill
Fur me an' Mary Jane.

They're buildin' wireless telegraphs
Fur use across the sea;
I don't believe they'll be much good
To Mary Jane an' me.
I'd rather whisper in her ear,
A walkin' down the lane;
These new inventions ain't much use
To me an Mary Jane.

—Washington Star.

After a hard fight in the city council the limit to height of buildings in Chicago has been raised. There was a desperate effort on the part of some to restrict the height to 16 stories, but the fight was in vain.

HONESTY AND PERSEVERANCE BEST.

Andrews, the Detroit banker who lost a million of his bank's money in wild speculation, does not believe in the policy of making money slowly but safely. He plunged and plunged hard, and now he has not only lost his money and that of other people, but his good name. The ability to make large sums of money rapidly is a natural gift, just as much as in the case of famous painters and engineers. They were born, not made. It is well to remember that any person of moderate ability who has perseverance, industry and practises economy, will come out satisfactorily in the long run where one of greater ability but less common sense fails. Besides there are other things quite as desirable in life as a big bunch of money. Contentment is one.

WHY THE DOUGHTY SCOTS DID FLY.

Richard Harding Davis relates this incident which happened while he was acting as correspondent during the English-Boer war:

A regiment of Scottish highlanders, noted for their bravery in action, during the heat of one battle were suddenly seen to break ranks and run in all directions. The officers as well shared in the stampede, and apparently made no attempts to urge the men under them into line. Their behavior was a surprise to everybody on the field, and after the battle was over the colonel of the regiment was summoned before Gen. Roberts. "What the devil was the matter with your regiment?" asked "Bobs." "Well," replied the colonel, "there is not a man in the regiment afraid of a Dutchman's bullet, but we were steered into a field literally infested with wasps' nests, and you know, general, we were all in kilts and with bare legs."

HANDY FRUIT PICKER.

Among the numerous inventions for gathering oranges, lemons, apples and other of the larger fruits is one by a man

in New Mexico. The illustration fully explains the manner of its construction and use.

New York has a coffee wagon which supplies coffee and sandwiches to firemen. It is owned by the organized charitable societies. Cincinnati will soon have one owned by the fire department.

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FOR SALE—Five sets of 1-12 h. p. electric motor castings, for $1.00 per set. Photo for stamp. Roy A. Crihfield, Lincoln, Ill.

ENGINEER'S LICENSE—Mechanics, Engineers, firemen, electricians, etc., 40 page pamphlet containing questions asked by Examing Board of Engineers; sent free. Geo. A. Zeller, Publisher, Room 592, 18 S. 4th St., St. Louis, Mo.

FOR SALE—Job lot new electrical goods given us to sell; list for stamp. We handle everything electrical and at lowest prices. Stamp for catalogue. Dept. N., T. Binford Electric Works, 994 Washington Blvd., Chicago, Ill.

BUSINESS CHANCES.

FOR SALE OR EXCHANGE—122 acres all plow land in McHenry county; well fenced; good well and windmill; price $50 per acre. Address 400, Popular Mechanics.

FOR SALE—Locomobile runabout, nearly new, $400. Address 402 Popular Mechanics.

FOR SALE—Steam auto truck; cost $5,000; will sell for $300. 354 Dayton street, Chicago, Ill.

FOR SALE OR EXCHANGE—$8,000 stock fine clothing and men's furnishings. Address 401, Popular Mechanics.

FOR SALE—One Reeves 16-horse engine, 36 154 separator, wind stacker, weigher and feeder. All in A No. 1 condition; at a bargain. Address S. C. Dawson, 719 Virginia Ave., Indianapolis, Ind.

FOR SALE—A National cash register; good as new; also a few second-hand tinners' tools; write for list and prices. Edward F. Cords, Elkader, Iowa.

FOR SALE—Hardware business consisting of shelf hardware, cutlery, tinware, stoves, furnaces and tin shop. Stock will invoice from $8,000 to $10,000 with fixtures. Good reason for selling. Velde, Roelfs & Co., Pekin, Ill.

WANTED—A complete second-hand thresher outfit for cash. Address H. G. Thaete, Aspen, Col.

FOR SALE—We have 50 first-class chilled plows that we will sell at a bargain; full rigged with jointer. Sam'l Almy & Son, Trumansburg, N. Y.

WILL EXCHANGE—Good residence property in Aurora, Ill., well situated and well rented, for a stock of vehicles or implements. F. A. Taylor, Janesville, Wis.

EARLY OHIO SEED POTATOES, raised in the Red River Valley in North Dakota; macaroni wheat, millet, Hungarian, etc. Fargo Seed House, Fargo, N. D.

OLD ESTABLISHED FURNITURE HOUSE in best location in Denver, Colo. Owner has grown old in the business and wishes to retire. William Hennessey, 1540-46 Lawrence St., Denver, Colo.

FOR SALE—Second-hand circular saws, gummed and hammered complete, ready to run, practically as good as new. The Miller Oil & Supply Co., Indianapolis, Ind.

FOR SALE—A ¾-H. P. Pierce Gasoline Engine, Electric Sparker and Batteries, complete, in running order, for $35.00 cash. Wm. Matt, Fort Dodge, Iowa.

HELP WANTED.

IF ENGINEERS will send $1.00 to below address they will receive two blue prints, with tables and instructions, showing how to set valves and eccentrics in Corliss enginess, simple and compound, with one and two eccentrics. Jno. T. Lindstrom, M. E., 440 Liberty street, Allentown, Pa.

MOLDER WANTED (BRASS)—Good wages and steady work. Address the Simmons Mfg. Co., Kenosha, Wis.

Attractions for Next Week.

Fishing with kites is great sport. If you have not tried it you ought to. We will tell you how it is done in next week's Popular Mechanics.

Did man exist in the Coal Age? Science says not. The coal deposits near Scranton, Pa., says yes. The print of a man's foot was found in a piece of coal. Read about it next week.

Fighting fires in cities is easy work compared to rescue work in mines. Read about how it is done next week.

Speaking of fires, the whole fire alarm system of Bayonne, N. J., was recently disabled by a spider; one little spider that was electrocuted before he ever realized the consternation he had caused. It is in the next issue.

A New Yorker has a private aerial telegraph line; the power is carrier pigeons. The newest railroad headlight casts a beam into the sky that can be seen on either side, before and behind the train. One man can make a million pins a day. They are now using telephones in street cars. Kids for kid gloves never eat grass. If you take any interest in anything you will want to know about these things. Popular Mechanics will tell you next week. Remember, "It is written so you can understand it."

CAR BUILDERS (Brass and iron) and grille workers wanted—Light work. Wisconsin Iron and Wire Works, 186 E. Water-st., Milwaukee, Wis.

WANTED—Man capable of running two Simpson dry-press machines; good wages and steady work. Address, with references, room 4, The Ruggery, Columbus, O.

COPPERSMITHS WANTED — First-class; good wages to the right persons. Address, with references, S. E. Stender, 427 1st-av., Pittsburg, Pa.

COREMAKERS AND LABORERS WANTED—For brass foundry. William B. Anderson & Co., 11 to 17 S. Canal-st., Chicago.

CARPET LAYER WANTED—A first-class man; one that can make and lay carpets. William Mylins, 3d-st., Zanesville, O.

GLASS CUTTERS WANTED—At once; steady work the year round. Rudy Bros., Highland and Center-avs., Pittsburg, Pa.

WAGONMAKER WANTED—A first-class bodymaker on light and heavy spring wagons; good wages and steady work to right party. John Guedelhoefer Wagon Co., Indianapolis, Ind.

WANTED—A bicycle repair man; of unimpeachable moral character; wages $3.50. R. M. Greig, Anaconda, Montana.

CARVERS WANTED (Wood)—Men able to do sample work. Apply to manager Pullman Car Works, Pullman, Ill.

FINISHER WANTED (Wood)—A first-class man; steady. Original Mfg. Co., South Evanston, Ill.

AN EXPERIENCED MAN WANTED to take charge of planing mill. Address Geo. Schwartz, Schwartz, La.

WANTED—Boys who have worked on gold gilding on picture frames and moldings. Schram Bros., 14 Armour-st., Chicago, Ill.

SHOEMAKERS WANTED—Three first-class men; and one cobbler; wages no object. McNamara Shoe and Last Co., 206 N. 6th-st., St. Louis, Mo.

WANTED—Two or three first-class warm air furnace tinners and installers. The Stanton Heater Co., Martin's Ferry, Ohio.

TIMEKEEPER WANTED—Must be quick and accurate. Piano Mfg. Co., West Pullman, Ill.

BARBER WANTED—Good, single, sober, steady man. Address James Benson, 1015 Main-st., La Porte, Ind.

POSITIONS WANTED.

YOUNG MAN, aged 23, now assistant manager in the sales and shipping department of a large manufacturing concern in Ohio, desires position in the west. Reference, my present employers. F. W. Rea, Canton, O.

PLUMBER, GAS AND STEAM FITTER; can do all ordinary tin work; can figure and take charge of work; 16 years' experience; would like steady work. "Fitter," Sistersville, W. Va.

UNDERTAKER—Young single man of five years' experience in the furniture and undertaking business. Will furnish any state license. Address, Fred L. Griswold, Delton, Mich.

SALESMAN AND FIELD MAN with ten years' experience in the retail implement, vehicle and wind mill business, wants a road position. Address, Lock Box 8, Birmingham, Iowa.

CORNICE CUTTER AND DRAFTSMAN; practical and reliable; can take charge of shop, handle men and estimate from plans. "H. D.," 117-119 South Fourth-st., Philadelphia, Pa.

WANTED—Position in a machine shop or as boiler repairer by a sober, industrious young man with small family. Address Moses M. Hull, Fillmore, N. Y. R. F. D. No. 1.

WANTED—Position as engineer or head sawer. Twelve years experience and good reference furnished. Address J. J. Patterson, Kingman, Ill.

TRAVELING SALESMAN, having a large acquaintance with hardware and implement trade in ten states, desires position with responsible manufacturers. Correspondence solicited. Address Box 33, Archer, O.

Popular Mechanics

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GOOD TO THINK ABOUT
GOOD TO TALK ABOUT